JPRS 80361

19 March 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 96

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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CONTENTS

BRIEFS

SAGA-HOECHST RESEARCH AGREEMENT--Saga Petrokjemi and the West German Hoechst Chemical Company have reached an agreement on a joint research project to increase expertise in Norway in the field of biotechnology. The project will be carried out within the framework of Norwegian-German agreements and 12 million kroner will be requested from the West German Research Ministry for the project, according to SAGA-NYTT. The planned research project will concentrate primarily on increasing and protecting Norwegian cod reserves by the artificial breeding and feeding of young cod. This would complement a larger research project in which Norwegian authorities are involved. The Saga-Hoechst project originated in the work previously done by Saga Petrokjemi on single-celled proteins. These are proteins produced with methanol in a biological process. Through cooperation with the Central Institute of Industrial Research, Saga gained experience in the use of such proteins for fish food. The Saga-Hoechst project may create and develop new markets for single-celled proteins. This will be important for evaluating possible future Norwegian production of such products from methanol by the two companies. [Text] [Oslo AFTENPOSTEN in Norwegian 11 Feb 82 p 16] 9336

CSO: 3102/148

CHEMICALS

PLANT WASTE USED AS FEEDSTOCK FOR PLASTICS MANUFACTURE

Zurich CHEMISICHE RUNDSCHAU in German 20 Jan 82 p 3

[By Rudolf Weber: "Car Doors From Corn Stalks?"]

[Text] Life today and in the future without plastics is no longer imaginable--from the automobile steering wheel to nylon stockings to dentures. For the most part they are produced today from petroleum so that plastics also become increasingly more expensive with the cost of petroleum. But, of course, coal can be used in place of petroleum as the basic material, yet it too is likewise involved in price increases. As everyone knows, necessity is the mother of invention, thus many researchers are looking around for new, cheaper basic materials. At the Advanced Technical School in Manchester, England, they are pursuing the route of obtaining plastics from plant waste. To be sure, this is basically not new because for decades wood has been used as a basic material for a number of cellulose plastics for packing papers, glasses frames, film and tape carriers or ping pong balls. However, the virtually unlimited variety of properties--from the softness of a foam to the hardness of a rocket material--which is possible with plastics from coal and oil, cannot be applied to these plastics. The research group in Manchester hopes to be able to make cellulose plastics equally versatile. Thus, it is aiming its efforts at the principle according to which all plastics are developed: a large number of chemically similar basic elements is linked or interlaced into giant molecules, the polymers (Old Greek: multiparts). In any case, the starting point is the basic materials, called prepolymers in technical language. In order to obtain them from beet leaves and corn stalks the researchers in Manchester first obtain cellulose from them, the building material of cell walls. In the next step the cellulose, a natural giant molecule, is broken up with the help of agents into smaller molecules, cellodextrins. These in turn can be transformed into prepolymers of the desired kind by "attaching" chemical compounds and finally they can be interlaced or linked into the actual plastic.

What appears obvious in such short sentences, is full of scientific and technical tricks. Nonetheless, in Manchester where the work has been going on for years apparently some major obstacles have been overcome. For example, they have succeeded in breaking down almost 99 percent of the cellulose into cellodextrins. And in the next 3 years the goal of "solar energy plastics" with a broad array of properties should be widely achieved. Among insiders this is how plant plastics are called because the initial material is formed from plants with the help of sunlight. They are to be used for technical components, for example, automobile

bodies, boats, and even airplanes. In order to provide them with the necessary rigidity and strength, fillers must be added to them--as to all plastics--(for example, chalk dust and glass fibers).

Even if there were success in meeting all these expectations for plastics--as in the case of space heating and automobile drive--the new materials will not be able to replace oil overnight. Experts estimate that in the no longer so distant year 2000 solar energy plastics will account for 10 percent of all plastics produced at that time.

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CSO: 3102/142

ENERGY

MULTIPLE-FUEL FLUIDIZED-BED REACTOR DEVELOPED

Oslo AFTENPOSTEN in Norwegian 15 Jan 82 p 21

[Article: "Multiple-Fuel Reactor Developed at Hamar"]

[Text] Better combustion systems are key words in the debate over future energy usage. There are few problems involved in burning pure oil and gas with high efficiency. It is not so simple, however, with fuel such as wood chips, peat, bark, household waste, and other types of waste. There are also problems involved in burning low-grade coal with high efficiency. In this connection, many researchers have put great faith in a combustion technology called fluidized-bed combustion.

For many years this combustion technology has been used with varying degrees of success. It is generally accepted that the technology has many advantages, but it also has certain weaknesses. The obvious advantage is that many types of fuel can be burned in the same furnace. One of the main problems is how to remove the lumps of ash that are formed without shutting down the furnace.

Now this problem has been solved by Hamjern A/S in Hamar and this company has patented the solution. Other minor problems also have been solved in the new furnace that Hamjern is offering in sizes ranging from 2 to 20 MW (equals 1,000 kW). The first pilot plant has been in operation at the Hamar factory just under 1 year and it soon will be ready for marketing. Among those interested in the new furnace is Sweden's largest private power producer, Sydkraft.

Senior engineer Nils Ivar Viken and civil engineer Odd Egil Solheim of Hamjern are behind the project. They point out what a great advantage it is that all types of fuels may be used in the furnace, since at any given time it is possible to use the fuel that is cheapest. It is also possible to combine several types of fuel at the same time, for example one half waste and one half coal may be used. Such a facility is especially well suited for use in district heating plants where one of the fuels used is waste. This special combustion technology also provides unusually high efficiency, about 85 percent. Another advantage of this special combustion

technology is that emissions of polluting materials can be controlled and greatly limited. This is especially true of nitrogen oxides and heavy metals. With other special devices, the emission of sulfur compounds and hydrochloric acid may be kept at an extremely low level.

In addition to use at district heating plants the multiple-fuel reactor, which Hamjern calls its fluidized-bed furnace, is also well suited for use in boilers in industries with some type of waste that can be burned. This is true in the lumber industry and in sections of the chemical industry. Hamjern is prepared to deliver these units complete and according to plans all production will be in Hamar.

Development of the Hamjern fluidized-bed reactor has been supported by the Oil and Energy Ministry's budget for prototypes of new energy sources.

CAPTION

The multiple-fuel reactor developed by Hamjern A/S can be "fed" with coal, as engineer Johan R. Rasmussen is seen shoveling here, wood chips, ground household waste, and other sources of energy. On the right, civil engineer Odd Egil Solheim is seen by the patented reactor, developed by him and senior engineer Nils Ivar Viken.

9336
CSO: 3102/148

SCIENCE POLICY

REPORT ON NATIONAL CONFERENCE ON RESEARCH, TECHNOLOGY

Paris ARP SCIENCES in French 21 Jan 82 pp 1-13

[Text] PARIS -- The "French model" of research and technology organization. M Jean-Pierre Chevenement, Minister for Research and Technology, in lengthy remarks at the closing session of the national research conference, held from 13 to 16 January, spelled out what he called the "French model" for organizing research and technology.

This model, "taking social demand into account in matters of research," and citing "our country's multinational heritage," ventures the following predictions:

a. Our way of handling research, says M Chevenement, must be made more democratic at every level. At the national level, in line with President Mitterrand's commitments, the government will ask Parliament to take the initiative and establish its own Office for Evaluation of Technological Decisions, so as to make available to the nation's elected representatives the objective elements requisite to a democratic debate. Its board could be made up of members of Parliament. It would have a scientific advisory council and its own budget.

b. The orientation and planning bill must make provision for establishment of a high council for research and technology in the research and technology ministry. It might be chaired by the minister for research and technology and half its members would be appointed at the recommendation of universities and of all partners in research (business, labor unions, professional organizations, association movements, etc.), and the other half would be chosen from among competent leading figures in the various scientific and technological disciplines.

It would be mandatory to consult the council on all reports on the look of the future and current state of science and technology, and on major issues in scientific and technological policy. It could formulate proposals and set up special study commissions.

c. At the regional level, advisory committees on research and technology attached to the regional councils would open the way to democratic debate on the regions' scientific and technological options.

These advisory committees could advise the regions in liaison with the regional delegates from the ministry for research and technology on

the establishment of regional technology magnet centers. The ministry can find money in its own budget to support action taken at the regional level when such measures fit in with the priorities for national action.

d. In the public research agencies, future reforms must move in the direction of greater democracy: the governing boards must include representatives elected by employees and some representation from outside the agency; the scientific councils and the statutory arbitration bodies must also include elected representatives of the employees, who will sit side by side with appointed council members.

e. In the end, the conference has demonstrated the broad value of debates on the orientation of research taking place within corporations. It might be necessary to make provision, particularly in the national corporations, for the company committees to hold regular discussions on the company's orientation with regard to its policy on corporate research. A scientific committee might possible be attached in specific instances to the legal structure of the corporate or plant committee.

Some have mentioned French-style quality boards. That message has been received. Our model of democracy must guarantee effectiveness by assuring that needs are made known at the top and that information circulates freely.

Furthermore, the minister continued, in so far as research specialties are concerned, they must be given status commensurate with the role research already plays in the whole domain of development and research. Government research specialists will be active simultaneously or subsequently in the functions of research, of teaching, of administration and upgrading research within government agencies or in private enterprise. With that goes a general obligation to spread scientific and technical information. The bill will lay down the general principles concerning first the guarantees attached to these specialties, equivalent to those for a reformed civil service. Once it becomes clear that research ought in fact to bathe and refresh all of society and that research people must mobilize in the laboratories, in the educational institutions, and in private enterprise, that mobilization, coupled with voluntary mobility, must perforce entail in return guarantees of employment and career, and of social rewards, particularly conditions of retirement.

Negotiations with the unions will begin within a few weeks. They will bear equally on the specific rules governing hiring, advancement or career promotions in government research agencies and on support for the latter. A special model statute might be written, to apply initially to staff at the National Scientific Research Center (CNRS) and at the National Health and Medical Research Institute (INSERM). Evaluation of researchers' performance would take into account all their activities in research, and in follow-up and passing along the fruits of their discoveries. Collective bargaining contracts in corporations should recognize the worth of training in research and the role of scientific workers.

Personnel regulations in the various public research agencies, while retaining their specificity, shall be suitably adapted to permit free circulation of personnel both within and among public agencies, teaching establishments, administrations, and companies, including nationalized companies. A special cell responsible for organizing exchange programs for scientific personnel among the various sectors of national activity will be set up at the research and technology ministry.

Of course, M Chevenement pointed out, scientific employment policy is an essential component of reform and renewal. Creation of new positions at the rate of 4.5 percent over the next few years will allow us to get the average age in our laboratories down to a slightly more youthful level and, I hope, improve the career outlook for all researchers.

It goes without saying that there can be no research and technology policy without a training policy. A major goal must be to attract more and more of the younger generation into research, and it is with this end in view that training for and in research must be systematically developed. Entry through research, backed by a system of scholarships considerably more prestigious than those now available, far more diversified, and far more generous, will be institutionalized in the universities, in the engineering schools and in the major scientific centers, as well as in research agencies or in corporate laboratories. We must of course underscore the fundamental role played by the university graduate schools in training through research.

In the area of tomorrow's sciences (biotechnologies, or microelectronics, for example) specific training action will be undertaken. A monitoring center for research flows and achievements will be set up in the research and technology ministry. Its mission will be to provide all necessary information for a consistent long-term policy of training through research.

Development of industrial research calls for training a lot more engineers through research. We must try to double that number by 1985, setting as our goal 1,000 engineers with research training and background by that date.

When you come to think of it, have we any more formidable adversary right now than fatalism and surrender in the face of the crisis?

And isn't the challenge that has been flung down to us the challenge to mobilize our people, to give them hope and strength of purpose, in a word to give them back their taste for action? To do that, we must first of all understand, and then help others to understand.

Besides all this, if we are to succeed, we must lift the human and social sciences out of the discredit into which they have knowingly -- if I may be so bold as to say so -- been plunged. Mistrust of science, once its object is no longer nature, only recently set free, for that matter, of its concern with basing human order on the order of things,

but has become society itself, that mistrust of what are called the social sciences is still distrust of man himself. Refusal to know always cloaks rejection of change.

The human and social sciences of recent years have taken particularly heavy fire. Mistrust and neglect combined have begotten the malaise we are only beginning to see a way out of, as your rapporteur so cogently pointed out.

A high-priority mission will shortly be assigned, predicted M Chevenement, to chart clearly and accurately, both on the material and moral levels, the ways and means to the necessary restoration of order.

There is no question but that this will be a lengthy task, but one in which essentials are at stake, since it amounts to nothing less than to give democracy a new content, a new meaning.

The challenge calls on us to place at the very heart of democracy the questions science poses, but also the things it does. (...) A tremendous effort at gathering specialized data -- data banks, scientific publications, editions of the major international magazines in French, will be tackled in the years just ahead by the Interministerial Mission on Scientific and Technical Information (MIDIST). Training specilized scientific interpreters, developing research into computerized translation, availability in French of all world scientific information -- it is nothing less than a mobilization program that we should be well advised to put into effect to insure that the French language will endure, particularly in the domain where it is in mortal danger.

Conference Followup

M Chevenement informed the conference that the bill had not been drafted as yet, but that it will be ready within the next few weeks, with the help of the rapporteurs who prepared the various conference summaries.

Predicting that decrees, regulations, and decisions of all kinds at every level would inevitably follow, M Chevenement said that he sees it as "essential" as followup to the conference to set up an organization which would continue and support dialogue and concerted action among those involved, at the regional level, in government agencies, and in the nation's corporations.

The ministry for research and technology, he added, would encourage the formation of regional assiciations to bring together everybody who has worked on organizing committees, the regions, and national corporations with a system of individual or group dues which would ensure some degree of autonomy and cover the cost of staff.. (particularly young people). A national association supported by CESTA, now on the drawing-boards, could provide a clearinghouse for these regional associations.

The regional organizations could encourage formation of technology promotion clubs in the regions, using the schools, technical centers, and National Science Research Center (CNRS) or university laboratories, as well as those in state-owned corporations.

These regional associations would be called upon to organize "regional councils," or to set up working groups to formulate plans and proposals.

At the regional level, involving large agencies and national corporations, I suggest preparation of precise and specific proposals which would then be summed up very succinctly on a single sheet of paper, using a model which could be designed very quickly.

National review and followup will then be organized, with indication of the various levels at which final decisions could be made.

The change must become swiftly and increasingly evident without wasting time but without precipitate haste. A year from now, we shall be looking over the record.

By starting this movement, we have challenged ourselves to change, It is for us, all of us, to pick up that challenge, M Chevenement concluded.

M Mauroy's Remarks to the Closing Session

As he closed the conference that had been opened by the president, Prime Minister Pierre Mauroy followed the President's lead in underscoring "the economic and social stake riding on research, which is one of the main responses to the crisis we are going through."

M Mauroy also laid some stress on the importance of nationalizations in this context; they will, he said "enable us to accentuate the spread of research and of new technologies."

"The great industrial conglomerates in the public sector will make an essential contribution to the national research effort. First of all by reason of their size, for these companies conduct about half of all industrial research, and because achievement of our goal of expanding a national research effort, in relation to the GIP, is intimately tied in with the growth of their own research effort. By transferring the research [lines missing] to industry, these great public agencies, thanks to close and diversified efforts at cooperation, exchange of research staff and of techniques for dissemination of results, and by a re-examination of the whole issue of sub-contracting."

Small and medium businesses will continue to play an essential role, the prime minister pledged, and added that "instead of crushing them, as they do all too often these days, the public corporations must pull them along in their wake. A very large corporation cannot in fact even begin to make everything its design offices come up with.

It would therefore be a good thing if research people employed by the national corporations were encouraged to set up small innovative private enterprises of their own.

"Not everyone who goes into research ought necessarily to make it his life's work. We must expect and plan for career changes. And spending some time in industry looks to me like one of the most promising routes to successful change."

Citing the various measures the government has already taken to help finance industrial research and innovation, such as increasing appropriations for the National Research Support Agency (ANVAR), the pending availability of stock in the Innovation-Development Company (INODEV), the granting of loans at very low interest, etc..., the prime minister argued that all this would be insufficient if the banking system as a whole were not mobilized behind these goals. Nationalization of credit, said the prime minister, "should enable us to implement a far more voluntarist policy, which I am asking the research and development minister and the economy and finance minister to get to work on right away."

"Other action," added M Mauroy, "will be taken. As of 18 January, for example, I should receive the report on the Center for Advanced Systems and Technologies Studies, whose mission will be to serve business and industry, but also to assist in training professionals or labor union officials."

In conclusion, emphasizing that he was talking to the researchers "as citizens," the prime minister said: "The nation is preparing to make a considerable effort on behalf of research. In so doing, the community formally recognizes the value of your function in society. This commitment implies, on your part, a reciprocal commitment. You cannot simply back away from your responsibility to make your work worth more, economically, socially, and culturally. Were you to do so, you would simply be turning a deaf ear to a nation that has confidence in you and expects great things of you.

"I am well aware that the idea of 'social demand' of which I am speaking right now has been mentioned a great deal at this conference. It is true that it is not an easy concept to define. Yet it does express a reality. I am asking you not to dash those expectations. I am asking you to help see to it that, at long last, the world of research and the society as a whole can speak freely with one another."

General Report from M Lazar

An "exemplary brew of men and ideas," an "undertaking without precedent in the history of science and technology" were some of the epithets used by Philippe Lazar, who presented the final report at the closing session of the national conference on research and technology.

While "some time will have to pass before all the profound and lasting consequences of this gathering are revealed, all indications give ground for hope that we shall not stay long at the talking stage... These are the political stakes, as of today," said Mr Lazar, before discussing the results and the spirit of the conference's labors.

1. Organization. "The prevailing vocabulary has itself changed. The old habit of drifting with the current has vanished into well-deserved oblivion, and all agree in discovering new virtues in operational democracy." But we must, beginning now, "bring the democratic debate to its conclusion, and that conclusion can only be a body of choices, once the various arguments have been heard and the conflicts, insofar as possible, resolved," added M Lazar, referring to the process as a "calm revolution."

2. Dialogue: the conference, which allowed "mutual discovery by groups which, hitherto, knew nothing of each other or, at the very least, seldom got together," should have as its first effect, "the establishment of new ties which the creation of regional or local associations for research and technological development should encourage and confirm." These associations should play "an essential role in the quantum leap of scientific and technical information."

3. Exchanges: Mr Lazar emphasized in this connection "the unanimous and urgent demand" for "removing the barriers that too often hamper the free circulation of men and ideas between the world of production and that of research," this shortfall in exchanges being attributable "first to the multiplicity and rigidity of regulations," but also to the "divergencies and compartmentalization that creep in gradually throughout the training process," all of it leading to "early casting of careers in concrete."

Regulatory changes must provide for and encourage "interprofessional fluidity" ("assured return to the job," procedures for temporary exchange of personnel). While there is no question of challenging the existence of creative functions (scientific and technical functions) of management and transfer (administration, exploitation, information) or of training, "no imperative other than structural and hierarchical rigidity implies that these functions must be performed on a permanent basis by the same men throughout their careers."

4. Regulations: "Standardization of regulations among public agencies for research and higher education" is important in this connection. "Applied without proper precautions, the civil service regulations -- as they stand -- would involve constraints incompatible with the proper functioning of research." However, "the dignity of the research worker's social function" must be recognized, and that implies "legitimate guarantees for his career and his social protection."

5. Evaluation: We must "seek out procedures which minimize the risk of indefinite continuation of activities of limited interest." In this context, it is well, before making any suggestions for improving the

present situation, to emphasize "the quality and the uniqueness of the evaluation system upon which certain public research agencies operate, which have institutionalized judgment by statutory scientific comissions which include heavy elected representation for personnel." However, within these evaluation bodies, "representation for technical and administrative engineers is manifestly inadequate," said M Lazar, who also underscored "the absence of balanced representation of researchers on university evaluation panels." To the rapporteur, "the current procedures for election and appointment of their members too often leads to the emergence of a mandarin ruling clique," while "majority impact has a tendency to slow or even interdict the growth" of marginal disciplines and of the as yet "undisciplined" sciences.

In short, we must scrap "evaluation-as-sanction," and seek more "to guide than to crush."

6. The Future: All those involved in the conference were stuck by "the extraordinary proliferation in this country of structures for research or innovation and by the extreme diversity and richness of the work in which they are engaged. (...) The whole idea is to find out how best to organize the conditions under which this potential operates and grows," which in itself involves "incontestable talents for self-organization." In M Lazar's view, "Above and beyond vigorous statement of the principle (of freedom), no doubt we shall have to concern ourselves more from now on with procedures that can guarantee everyone the right to manage his own activities within the context of planning flexible enough to allow him to do so, but at the same time rigid enough to guarantee to others the power to exercise similar rights with the necessary means."

After voicing the need for more research on peace and international exchanges, particularly with the Third World, M Lazar concluded with the thought that "the foundations for a real contract -- a moral as well as a material contract -- between the nation and its researchers and technicians runs beneath an "overriding demand for democracy." that implies "respect for diversity and for the free communication of ideas and of men," a "radical change in power relationships in all our structures," and the transition "to a higher phase of the exercise of responsabilities."

The Academy of Sciences Hopes for Continuation of the Advisory Committee on Scientific and Technical Research (CCRST) and of the General Delegation for Scientific and Technical Research (DGRST)

In its written contribution of some 40 pages to the national conference on research and technology, the Academy of Science voices its hopes for the retention of the CCRST and the DGRST.

"The role of bodies of this kind is a very important one, and it must be filled," says the Academy, which goes on to define the role they have in fact played since their establishment in these terms:

"The advisory committee on scientific and technical research (CCRST) has been active for 23 years. Its value is recognized. Its horizontal structure cuts across those of the user ministries and research agencies that follow the vertical mode, and this enables it to act clear-sightedly in coordinating research. Experience has consistently demonstrated that the 16 members of this committee are people with unchallenged stature, attentive, hard-working, who agree to survey the entire field of scientific and technical research for a period of years with great breadth of vision, and they are free enough to state independent opinions.

"The general delegation for scientific and technical research (DGRST) which, with its facilities for study, inquiry, and evaluation, lives in perfect symbiosis with the CCRST, conducts a continuous analysis of the status of interaction or lack thereof within the system in which basic research, applied research, and research and development are all intricately involved.

"It is thus in a position to single out the promising sectors which must be given vigorous aid, and the areas currently in a weak state, but which are sorely needed in the community, and which must be helped. The DGRST reports on these, and spells out the options in detail. In addition, the DGRST has the means to provide incentives whose role is vital: concerted action, interdisciplinary action, and joint university/industry action.

"The DGRST is a lucky French invention, and it behooves us to hold fast to it, in its present form or another."

Labor Union and Political Comment

Some 200 representatives of labor and employer organizations took part in the conference, while only spokesmen for the political parties in the government majority responded to the invitation to attent.

Messers Alain Devaquet (RPR) and Michel Pinton (UDF) did not take the floor during the plenary sessions, which were reserved for reports from the commissions and for remarks from labor, management and political sources.

All speakers commented favorably on the sessions of the conference, thanks to which, said M Guy Hermier (PCF) "Scientific policy becomes the whole nation's business," but there was a discordant note from the CFDT: its spokesman, M Michel Rolant, criticized "the hasty short-cuts that marred its preparation," as well as the way the procedings were "dominated by research professionals."

Several speakers raised the issue of financial ways and means: one was M Lionel Jospin. The first secretary of the PS warned that the necessary increase in appropriations must not "lead to excessive influence from the state, even though it is a state we have reformed." That remark brought enthusiastic applause from the audience.

Most participants emphasized the bond between science and technology and the needs of the economy. In the view of M Rene Le Guen (CGT), all scientific progress must encourage "a new logic in development," spurning "the discriminatory and stifling choices of research fortresses that promise a quick return on investments."

The spokesman for the National Council of French Employers (CNPF), M Georges Boudeville, called for some easing of the value-added tax for corporations on the basis of "the rise in annual costs of research and development."

From the other side, Mme Huguette Bouchardeau (PSU), like M Rolant before her, protested against the "illusion that technological innovation can become the foundation of a recovery policy." M Hermier ventured the idea that science and technology alone are not enough to get us our of the recession."

Communication between the research community and laymen was taken up by two speakers: M Henry Bordes-Pages (CGC) rejected the notion that "science is a preserve set aside for the experts," while M Robert Cottave (FO) called for "opening up research to the French people (by) creation of a fourth TV network devoted solely to social, economic, technical, and scientific information."

Satisfaction for the demands of research personnel, particularly with regard to career status, was demanded by all union spokesmen, while the representative of the National Union of French Students (UNEF), formerly known as Renouveau, deplored the "precarious lot of students just completing their undergraduate work."

Lastly, M Alain Mouchoux, of the National Education Federation (FEN), complained about the paucity of funds for pedagogical research, which "amounts to only one 300th of the national education budget." The spokesman for the national federation of farm operators' unions (FNSEA) protested at the inadequacy of agronomic research, "considering the importance of agriculture."

National Open-Door Day for Laboratories

The Open Door days held in almost 1,000 laboratores and research centers on 16 January met with enthusiastic response from people all over France.

The scientific and industrial community mobilized en masse, as an adjunct to the national conference on research and technology, to show the potential of French research. Scholars in serried ranks in the morning, and families or science buffs in the afternoon, swarmed into most of the most prestigious public, university, private, and industrial research centers in France.

They were welcomed by research and technical staffers who, sometimes with the aid of films, patiently tried to explain the secrets of the atom, of the galaxy, of immunology, or even the automated subway system.

It was the big centers -- particularly the nuclear study centers (Saclay and Cadarache), the national center for scientific research (CNRS), the Pasteur Institute in Paris, the national space studies center at Toulouse, the observatories (meudon, Haute-Provence), and universities like the Polytechnic or the agronomic research centers -- that attracted the biggest gates.

At the national space study center in Toulouse, close to 3,000 visitors eyed the pot and Marecs satellites, the infrarouge remote detectors, and the exhibit of the Argos and Sargos balloon systems.

In Provence, 50 laboratories opened their doors, among them the Cadarache nuclear studies center and the Haute-Provence observatory. In Lille, the University of Sciences and Technologies offered an example of collaboration between the university and industry, under whose joint aegis the research workers had devised and developed a totally automated system for operating the subway. At the center, visitors were particularly fascinated with the Nancay (Cher) radioastronomy station, and the laboratories at the Orleans office for geological and mineral research (BRGM), as well as with the national institutes for agronomic research (INRA).

Further west, the University of Rennes showed the public its collection of ores and offered lectures on continental drift or European agricultural policy. In the Paris area, at Saclay, several dozen engineers were on hand to show the public around the Osiris and Orphee reactors.

Just about everywhere in France -- except in the Bordeaux a and Strasbourg areas, where the public tended to stay away -- visitors commented on the helpfulness of this "Open Door" operation, and expressed the hope that "it would happen more often."

INRA's Contribution to the National Conference

The National Agronomic Research Institute (INRA) took part in all the regional conferences preliminary to the national conference. For the latter, seven of the Institute's specialty topics were chosen by the general directorate, after discussion with the members of the scientific committee and of the board of department heads and administrators:

-- aims and orientation in agronomic research and new models for economic and social development;

-- the "chain of knowledge" in agriculture: research, higher education, professional training, development, and getting the word out;

-- putting the findings of research in agriculture and in the agribusiness to good use;

-- quality and consumer problems (environment, life surroundings, quality of food products);

-- adapting the INRA to its national and regional missions -- internal structure of the plant -- problems posed by the existing infrastructure (diversity of situations, heritage of the past, demands of the future;

-- INRA's place in the national, European, and international science community -- optimizing synergistic effects;

-- agronomic research and international technical cooperation, with special emphasis on the developing countries.

ORSTOM and GERDAT OPERATIONS

The Office for Overseas Scientific and Technical Research (ORSTOM) offered an audiovisual series from 13 to 19 January on its activities in the area of health, as part of the exposition mounted in Paris at Radio House to coincide with the national conference.

Behind this presentation by ORSTOM, a public agency that cooperates with 25 countries, was a desire to inform the public of the gravity of endemic diseases, both at the health level and in its impact on economies. ORSTOM chose onchocerosis (river-blindness) as an example. Onchocerosis is the number-two cause of blindness worldwide, a disease that affects 20 million people and hampers economic development in the countries of West Africa, which are already among the poorest in the world.

In Upper Volta, ORSTOM, in collaboration with WHO, has developed a program for stamping out the disease -- a task that will take 15 years -- by destroying the larvae of the fly which is the vector of the disease. This action involves helicopter spraying of larvicides weekly on the surfaces of all rivers and streams, combined with medical monitoring of the populations.

At the same stand in the exposition, the Study and Research Group for the Development of Tropical Agronomy (GERDAT), which coordinates the work of eight tropical agronomy applied research agencies, displayed two laboratory devices: a coffe-pulp fermentation vat which produces methane, and a cracking distillation oven that turns vegetable oils into fuel for internal combustion engines.

6182

CSO: 3102 /147

FAILURE OF MDF-100 PROJECT, FOKKER'S PLANS NOW

Amsterdam ELSEVIERS MAGAZINE in Dutch 13 Feb 82 pp 142-145

[Article by W. A. Verwoerd and J. Heinemans]

> [Text] Within 1 hour, the contract between Fokker and McDonnell Douglas was broken. "Actually, we were all of us quite relieved," Frans Swarttouw says. "The decision to start the project together was a heavy one, the decision to stop it straight away was at least equally difficult. Actually, we could have continued it but, then, at the risk of putting 500,000 guilder or more into the project while not being certain at all whether it would be a success."

Sunday afternoon at 2 p.m., in his room in one of the Fokker buildings. Frans Swarttouw has just returned from the United States. "For the first time in my life, I have slept for 14 hours in a row." He does seem somewhat tired. Nine months ago, the sky still seemed the limit for Fokker. The cooperation on which Fokker and McDonnell Douglas had decided in May of 1981 was a logical consequence of the cut-throat competition in the replacement market for passenger aircraft.

Frans Swarttouw had earlier been to Seattle, where he had approached the giant Boeing. However, he was told there: "You may work together with us, but only on our conditions." It could not have been more honest. "But we did not feel like that. We were then able to make the deal with McDonnell Douglas. It is true that this was not the strongest partner of all, we knew that they were left practically stranded with their DC10 project and that the successful DC9 program was coming to an end, but we had now at least a possibility of developing a third position next to Boeing and Airbus. Time was running short, we were already late."

In the course of the coming years, costly, noisy aircraft consuming much energy, such as the DC8 and DC9 and the Boeing 727 and 707 will rapidly be discarded. There is thus a new market, and, in that market, Fokker and McDonnell Douglas would start competing with two formidable competitors. For short and medium-range distances, Boeing is busy with the extended 737 and with the 757 and 767, which already now seem to becoming a success, and for which Boeing has already received well over three hundred definitive orders and of which the first 757 aircraft will be delivered at the end of this year.

Airbus has obtained a firm footing in the world and especially in Europe with its A310 and A300. Of the A300's (250 seats), more than 150 aircraft have already been delivered, of the A310's (200 seats), 178 orders are on hand. Companies such as Lufthansa, Air France, KLM and Swissair, SAS and Alitalia found the Airbus the ideal medium-range distance aircraft, which will thus form the nucleus of their new fleets. At the moment, four Airbus aircraft are being built per month, and by 1984, the number will already have risen to eight per month.

Was the gap in the market then quite as big as felt by Fokker and MDD about 1 year ago? Not only because the competitors were already busy, and Fokker-MDD actually still had to start, but there were other threatening disappointments. Manufacturers of jet liners are not prospering at the moment. Also they are being hit irrevocably by the world-wide recession. Although the big international airline companies have developed plans to drastically modernize their worn-out fleets in the eighties, these plans remain in cold storage longer than was originally foreseen. Due to a decline in the demand for transportation, on the one hand, and to sharply increased costs, on the other hand, international airline companies suffered a total loss in 1981 of nearly 3 billion guilder.

Such difficulties are not exactly a stimulation for managements to invest huge amounts in new aircraft. However, in the long run, the companies have no choice. There is an urgent need for much more efficient aircraft than the ones now in the air, and which, as far as fuel consumption and staffing are concerned, have become outdated. The manufacturers thus assume that, in the course of the next decade, new aircraft worth well over 300 guilder will have to be ordered. According to Boeing, there is, undoubtedly, space in the air for 3,500 to 4,000 new jet liners.

The stagnant development in air traffic has, however, already caused a few dramatic changes in the plans of manufacturers. Lockheed, for example, decided to stop its production of Tristar L-1011 by 1984. The program already last year caused Lockheed a loss of nearly 200 million guilder. Also McDonnell Douglas was hard hit: the already stagnating DC10 program was given a severe setback after options were abandoned and new orders failed to come in. Thanks to an order from the Pentagon, it was possible to maintain production of the DC10's for still some time, but, everywhere in the world, DC10 aircraft are, at the moment, for sale or for rent, often at ridiculously low prices. After the bankruptcy of Laker, a total of 57 DC10's are standing unused on the ground.

The fact that MDD was able, in 1981, to increase its profits by 20 percent to well over 175 million dollars (400 million guilder) was solely due to the production of non-civilian aircraft. In the civilian sector, MDD last year lost 85 million dollars, amply 200 million guilder. No wonder that the rumors toward the end of 1981 became increasingly stronger that MDD before too long would withdraw from the civilian sector, that it would, at the most, be concentrating on the extended DC9, the Super 80.

However, these rumors were not decisive in making the decision to cancel the contract between MCDonnell-Douglas and Fokker. There were other grave difficulties. "When designing the MDF100, we assumed that the fuel costs would shortly increase to 1.5 dollars per gallon (4.5 liters). But as a result of the economic recession, oil producers have had to adjust their prices to the changed market conditions, so that the kerosene price is now 1 dollar per gallon. Gone was the advantage of the

economical MDF engine. A second factor, which we were unable to foresee, was the strike of traffic controllers in the United States and the subsequent dismissal of 12,000 employees."

The U.S. companies immediately took action: routes were discontinued, other routes were either flown less regularly or bigger--completely fully booked--aircraft were dispatched. The small demand--also a consequence of the recession in the United States--has had the effect that proposed investments of U.S. domestic airline companies were postponed indefinitely. And on these very companies, especially Delta, MDD and Fokker had primarily set their hopes for their new 150-seaters.

A third and perhaps decisive factor is the lack at present of a suitable engine. For engine manufacturers are also somewhat reluctant, dare not quite well, for the development of a new engine costs a fortune--approximately as much as the development of an entirely new type of aircraft. For a suitable engine, three candidates were, in principle, in the market: the Rolls Royce/Japanese RJ-500, a new version of the French-American (Snecma-General Electric) CFM-56, and an engine based on the Pratt and Whitney PW-2037 engine, the PW-STF-633. All of these sources of power have to have a propelling power of approximately 25,000 lbs.

Fokker, what now? Swarttouw: "All kinds of things are happening with us. A new situation has arisen, that is for sure, in which we shall have to focus all of our attention on the existing F27 and F28 projects, at the same time as we shall have to continue our studies on new advanced aircraft. The present form of the F28 does not allow for any flexibility. We cannot, for example, just extend the aircraft, then we would have to develop an entirely new wing. But there is still plenty of interest in the F28. When I came here 3 years ago, ten F27's and just as many F28's were being built per year, while there were still a couple of unsold ones. Now we make 24 Friendships with different specifications and 18 Fellowships per year, and we have got orders on hand for 18 months."

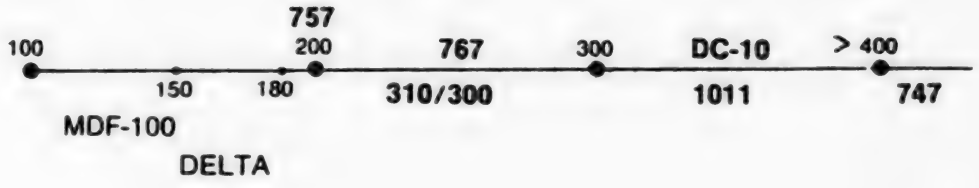
"What have we achieved in addition? We have canceled an entirely unsuccessful merger with VFW, and we have cut the ties with MDD, so that we can now concentrate our attention on our own existing projects. We believe that we shall be able to usher the F28 into the nineties, and that is something quite different from what I heard when I first came here and they said: 'The F28 is virtually finished.' We are slowly becoming the only ones in this section of the market. Abroad, the construction of this type of aircraft--and ideal feeder liner--is hardly being considered anymore."

"The F27 Friendship is in need of modification. We have a large staff on hand to modernize it. We still do not know whether minor or major changes will be involved. The research is still going on, but the least change that must take place is that the F27 be equipped with a better engine, and, then, it will be quite possible, for example, to extend the aircraft. But also here there are engine problems, for a suitable prop fan (propeller engine with jet propulsion) is not yet past the development stage, perhaps we may not expect this to happen until the early nineties."

"We keep our doors open, keep looking beyond our borders, for example to Japan, and we would not mind to enter into new projects with foreign manufacturers on a modest scale, for example on a 30-70 basis. But we are certainly in no hurry in that respect. I am no advocate of mergers," says Swarttouw. "Enterprises of

completely different cultures are extremely difficult to combine. We have, for example, a man sitting in Japan who is now explaining the situation which has arisen. For we want, after all, to make sure that the relations which were developed at an earlier stage are not cut off definitively."

"We also remain in negotiations with MDD. It is true that MDD already has said that the development of an aircraft for more than 150 passengers will be continued there, and that the possibility of cooperation with potential partners (other than Fokker) will be further looked into." Swarttouw considers it nonsense to talk about leakages of know-how. "Of course, we have been looking into each other's kitchens, it has been a clearly two-way traffic. But it is greatly exaggerated simply to say that McDonnell Douglas would have learned everything from Fokker. They know in Long Beach just as much about aircraft as we do, perhaps even more."



In the above illustration, Frans Swarttouw shows where the MDF-100 plans were finally abandoned. There is a new market for aircraft for between 100 and 400 passengers. From 200 seats and upwards, the market is more or less equally divided. The MDF-100 project aimed at about 150 passengers, but Delta, the most important potential customer for MDF 100's, wanted more, approximately 160 seats, and was in this supported by McDonnell Douglas. Fokker feared, however, that a too large MDF 100 would have to contend with the Boeing 757, a formidable competitor already in production. When McDonnell Douglas kept putting off the final talks on the extent of the aircraft, Swarttouw got strong feelings that McDonnell Douglas did not want any competing aircraft for their own Super 80, which was selling well.

ORDERS LARGE COMMERCIAL AIRCRAFT

PRODUCER	1981 NEW ORDERS TYPE	NUMBER	TOTAL ORDERS THROUGH 1981	TOTAL DELIVERED
Airbus Industry	A-300	26	324	158
	A-310	19	178	0
	A-320	50*	50	0
Boeing	727	24	1,824	1,784
	737	129	990	730
	747	22	586	536
	757	24	136	0
	767	7	173	0
British Aerospace	146	25	25	0
Fokker	F-28	21	191	174
Lockheed	L-1011	5	241	217
McDonnell Douglas	DC-10	20	409	362
	DC-9	28	1,112	1,025

*Air France order: 25 definitive and 25 options

7262
CSO: 3102/154

BAE 146 CONTINUES SUCCESSFUL TEST FLIGHTS

Gelsenkirchen AEROKURIER in German Jan 82 p 8

[Text]

The prototype of the BAe 146 Feederliner already has had 100 hours of flight testing. The BAe 146, which in addition is the first British civil aircraft project in 18 years, is designed in its 100 version to transport 109 passengers--mainly over short stretches. At present there have already been 13 definite orders and 12 options. First deliveries are planned for the end of this year. As moreover reported by British Aerospace, the second prototype of the BAe 146 will shortly make its first flight.

8008
CSO: 3102/150

AIRBUS: FUTURE PRODUCTION, MARKETING STRATEGY OUTLINED

Gelsenkirchen AEROKURIER in German Jan 82 pp 17-24

[Article by R. Doerpinghaus: "Europe's Big Opportunity: Airbus A320 Confronting Decision"]

> [Text] Headlines from Toulouse: Shortly before the end of the year Airbus Industry passed the "magic mark" of more than 500 aircraft sold. The airbus A300/A310 is thus after the Boeing 747 the second long-range aircraft to have been ordered in a quantity exceeding half a thousand. To be exact, on 8 December there were 507 orders and confirmed letters of intent to purchase for the A300/A310. Thus the airbus order bookings already extend up to April 1986. Altogether 44 airlines have decided in favor of the airbus. What is more, in 1981 the airbus A300/A310 quite clearly emerged from the race for the long-range aircraft market as the victor in its class. With a total of 45 units sold Airbus Industry was sure of a 54-percent share of the market. With its models 747 and 767 Boeing received a total of 26 percent of the long-range jet market in 15 sales of the former and 7 sales of the latter. In the year 1981 so critical for air transport Lockheed with eight sales of the L-1011 TriStar and McDonnell-Douglas with eight sales of the DC-10 could command only 10 percent of the market.

Worldwide at the end of 1981 about 160 airbuses were already in use. But not only in sales but also technologically Airbus Industry aimed at making headlines at the end of the year: At the beginning of January the first airbus with a two-man cockpit is being delivered, after grant of the basic licensing [Musterzulassung], to the Indonesian airline "Garuda." The Garuda cockpit is a first stage of the FFCC cockpit which in the future will be provided as the standard for the A300/A310. The Garuda cockpit differs from the FFCC primarily in the absence of image-screen instruments. But it is otherwise largely the same as the FFCC cockpit and already possesses a large portion of the operating and system simplification. But also at the end of the year the first A310 was just about to be completed. While a formal rollout was dispensed with, nevertheless it certainly would have been worthwhile to present the A310 to the public with somewhat more fanfare. Such ceremonies are admittedly not necessary but in the interest of public relations (and Airbus Industry still has need of these) should not be

neglected. It is also necessary for the future of Airbus Industry that the public in the partner nations should identify with this aircraft program and to this end it is not only sales figures but also a little psychology which is requisite.

But also at the end of the year the A320 program for a basically new 150-passenger transport aircraft has entered into a decisive phase. After Air France already in May of last year had been the first airline to order 50 airplanes the project definition was further refined and sharp-tuned in negotiations with other airlines, especially the American Delta Airlines. The two originally planned airframe variants were in this process amalgamated into one basic version which, however, is being offered with different tank capacities and maximum takeoff masses. At the same time at the end of the year there was a lot of agitation about the possible power plants of the A320 for which now favor is probably being given to a further developed CFM56 version based upon the currently available power plant technology. The advantage: if the A320 were introduced in the year 1986 the power plant would already have been best tested by being used in the modified DC-8, 707 and KC-135.

If Delta Airlines should decide for the A320 then finally all signals would probably be "go" for the Baby Airbus. The decision is expected to be this spring.

But at the end of the year the airbus program should also be viewed under its national economic aspect. After Airbus Industry in October was designated by the French Government as the greatest exporteur (German fraction MBB/VFW 37.9 percent) and with the unemployment figures in all partner countries reaching new record marks this winter it is especially pleasing to be able to assert that the construction of large civilian aircraft is also being reckoned over the long term as a growth industry. Until the end of the millenium there is expected an average annual passenger growth in air transport of more than 6 percent. In addition, there is the fact that in the next 10 years one must expect replacement of at least half of the present airline fleet.

If in addition one takes into account that industrial nations dependent upon export such as the FRG have lost their lead in many areas then one sees more clearly the importance of civilian aircraft construction for the maintenance of highly trained job slots in the eighties and nineties. At the same time, however, one may not rely just on the success up to now of the A300/A310 but even today one must initiate two programs in order to secure a certain continuity.

People have already become almost accustomed to the reports of success from Toulouse: More than 500 airbuses of the type A300/A310 have already been sold and the fleet plans of the airlines which have already ordered the airbus lead one to expect further substantial orders in the future. And it is already a fact that the airbus has restored to European aircraft builders a good part of the self-confidence which not very long ago they appeared to have lost. Today it can be said not without pride that the airbus is after the Boeing 747 the most sold long-range aircraft in the world. And more besides: The airbus program ranges far beyond the turn of the millenium into the future and thus assures thousands of highly trained job slots in all partner countries. An essential contribution to the success of the airbus was the recognition that one cannot sell aircraft

which are identical down to the very last rivet but that in an aircraft program of this magnitude one must be flexible from the outset in order to be able to adapt oneself to the needs of the different airlines throughout the world. In other words: it was of essential importance for the success of the airbus that its early development was in the direction of a family. And today even this family has become already highly ramified. In the meanwhile there have been so many subversions that no one airbus is like another but each airline is in a position to select from the available palette of offerings the model which best fits its conceptions and its operating conditions.

The development of the airbus program has not only largely restored to the Europeans their self-confidence in aircraft construction but it has also taught the Europeans again that in aircraft construction one must think in terms of eras of time and not let oneself be irritated by short-term ups and downs of passenger statistics and airline profits. For aircraft builders and for the strategists of the fleets of the great airlines this is by no means a new insight. What is new is the fact that the European aircraft builders have succeeded in establishing a consciousness of this among the participating governments and have thus succeeded in creating a reliable basis for building Airbus Industry.

Now one must not allow oneself to be blinded by the present success of the airbus. This success can persist only as long as it is worked upon continuously and solidly. Technical development in the construction of large-scale aircraft moves ahead so rapidly that a permanent system of program innovation is required if success is to be lasting.

But the industrial capacity which has been formed with Airbus Industry in Europe at the same time compels one to look beyond the present outlines of the program and to search the market for new possibilities and demands.

In view of the long program advance times which are absolutely necessary today in large-scale aircraft construction market research for a new transport plane becomes extraordinarily difficult. Such market analysis can only be based upon air transport prognoses for the time period in which the to-be-developed airplane shall be used. In other words: the airlines must tell the airplane builders today what airplane they will need in 8 or 10 years.

However, a glance at oil price developments in the last 10 years shows the extent to which the times change and how little they adhere to the most careful prognoses. No one, for example, at the end of the sixties could predict the fuel costs which airlines are having to struggle with today and predict the role which fuel costs would play in planning airline fleets. It is against this background that one must also view the further product planning of Airbus Industry. Today it is not the manufacturer of a transport airplane who decides what type of aircraft he will build but rather this decision is finally made by his customers.

Against this background Airbus Industry has defined the further industrial goals:

First priority is given to the development of a market position which is as strong as possible on the basis of the present models A300 and A310.

At the same time it is also necessary to exploit the progressive technology developed within the context of the airbus program and also the advantages arising from international cooperation within the framework of Airbus Industry. This--according to Airbus Industry--should take place in three ways:

a. continuous improvement of the existing range of products,

b. development of new models and procedures,

c. entrance into new market areas which have thus far been untouched by the A300 and A310.

With regard to the development of new models there are substantially two possibilities:

a. the development of a short-range to medium-range jet for 150 passengers. Here one is dealing with an airplane which must be more or less completely developed from the bottom up in which, however, it must be possible to make the most extensive use of the technology currently available in Airbus Industry and in development;

b. the development of an approximately 230-passenger long-range version on the basis of the present A300/A310 with 4 engines.

It is thus the long-term goal of Airbus Industry, like the Boeing model palette, to offer a suitable model in each of the current aircraft categories.

Since after the exit of Lockheed from the marketplace of firms offering transport planes there remain with Boeing, McDonnell-Douglas and Airbus Industry only three manufacturers it is considered in Toulouse that a market share of at least 30 percent would be realistic.

The Big Opportunity: A320

Of all the market segments investigated at the present time by Airbus Industry the A320 has crystallized out as probably the most interesting project. And in fact the international airlines seem to be crying for a 150-seater in new technology.

Airbus Industry estimates the presently recognizable market potential for 150-seaters worldwide at about 3,135 aircraft up to the year 2000. This estimate is based upon an evaluation of the internal transport plans and prognoses of a total of 189 air transport companies throughout the world including 38 North American, 56 European, 29 South American, 20 African and 31 Far Eastern air transport companies. On the basis of the same investigation Airbus Industry reckons that about 565 aircraft out of this demand package can be met by existing models or by direct developments of currently existing models. The majority of these 565 sales would involve the models DC-9 Super 80, Boeing 737-300 and Boeing 757-200. The remaining open market potential for a new airplane would accordingly run to 2,600 units. This does not include potential purchases by smaller airlines, charter airlines, governments and military agencies. As a projected development

goal, according to data from Airbus Industry, the A320 in comparison with today's Boeing 727-200 should consume 46 percent less fuel and permit operating cost reductions between 23 and 27 percent. Airbus Industry wants to make these more-than-ambitious goals possible on the basis of a to-be-newly-developed aircraft in the realization of which all existing design terms of reference will be disregarded and all available new ideas and technologies can be built in and planned in advance. The development of the A320 took place essentially during 1980 and the first part of '81.

On the occasion of the Paris Aerosalon 1981 Air France as the foremost airline of the world announced its decision in favor of the A320 and ordered no fewer than 50 aircraft at a clip. The industrial risk for the development of an airplane of this category and of this technology is nevertheless so great that the starting contract of a European airline, even one of the size of Air France, does not suffice to completely give the new airplane the green light. Therefore Airbus Industry has made intensive efforts in the past year to win further potential customers for the A320. The most promising candidate was the American Delta Airlines. Up until the end of the year consultations between Airbus Industry and Delta Airlines took a very promising course. In the course of these consultations Airbus Industry declared itself ready to examine* fully the wishes of Delta Airlines and amalgamate the originally planned two basic versions of the A320 in one new model which nevertheless is from the outset to be developed in two versions having different tank capacities. These ideas of Delta Airlines had to be fitted in with the ideas of Air France, the first and thus far only A320 customer; happily this was possible without any serious complications. In the development of the A320 Delta Airlines "slid" more and more into a supporting role. More and more airlines interested in the A320 declared that they wanted to wait out the further negotiations between Airbus Industry and Delta Airlines. In other words if Delta signs the sales contract, which according to rumor would amount to a contract of the order of magnitude of at least 60 airplanes, then additional European and presumably also some American airlines would immediately follow and more or less simultaneously with Delta Airlines order the A320. The special leading role of Delta Airlines may be explained by the splendid operating situation of the latter airline which remained almost untouched by the great crisis which at the time is affecting international air transport.

Up until the end of the year it was possible to say that the negotiations between \irbus Industry and Delta Airlines were running exactly according to program. lowever, the power plant question turned out more and more to be the central point of the negotiations. An airplane having the performance guaranteed by Airbus Industry is not realizable without new power plants. However, the big all-decisive question is whether these dream power plants will or will not be available in time for the potential introduction of the A320 in line service in the middle of the eighties? And as things appear now the chance that at least one of these "superpower plants" will be available right now seems extremely questionable. Just the development costs of a high-performance power plant of the technology class required by Airbus Industry is estimated on the basis of 1981 prices at about $2 billion U.S., assuming the use of already existent technology and components.

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* Or "accede fully to." The German word is ambiguous--translator's note.

Altogether three power plant candidates are available; these, however, involve more or less provisional projects. The primary candidate is certainly a power plant on the CFM56 basis. The CFM56-2000 power plant pushed for a long time by Airbus Industry would probably be realizable only with difficulty because of its expected high development costs. On the other hand, however, the question arises whether in view of recent oil price prognoses, which proceed more on the basis of stable prices rather than upon the basis of soft prices, the costs of a maximum technology power plant aiming at fuel conservation are at all justifiable at the present time?

Instead of this it appears essentially more realistic to develop on the present basis of the CFM56 motor a more cost-favorable variant specially designed to meet the requirements of the A320. Such a power plant would have the advantage that on the one hand it would be rapidly available and that on the other hand upon the introduction of the A320 it would be a fully tested motor that had got over its childhood illnesses. Since time presses and money sources for power plant financing of the order of billions are at the present time not discernible a CFM56 further developed to a modest extent would be a realistic solution from the industrial point of view.

The manufacturer of the CFM power plant is CFM International in which the American General Electric Company and the French Snecma have combined.

A close competitor in the discussion is the British-Japanese power plant RJ500-35. Rolls-Royce, hard hit by termination of the Lockheed TriStar and hence by the reduced production of the RB211 will surely wager everything on one card in order to be able to offer a power plant for the A320.

As a third manufacturer in the FRG Pratt and Whitney is competing with the STF626M power plant for the airbus A320 opportunity. Direct participants in the development of this latter power plant are the German MTU and Fiat in Italy.

Design

The most important step within the context of the A320 program was the specification of a single airframe which depending upon seat arrangement offers room for 150 to 162 passengers. In the A320-100 version the new short- to mid-range airliner would have tanks available only in the wings. In the A320-200 version the aircraft would receive an additional mid-fuselage tank to increase its range--this, of course, would presuppose licensing of a higher takeoff weight. With its full passenger complement the A320-100 should have a range of 1,700 nautical miles (3,150 km). Likewise, fully occupied the A320-200 would have a maximum range of 2,700 nautical miles (5,000 km). According to the present status of the program the A320 could commence its line service with the airlines by the middle of 1986.

The A320 is a "single-aisle" design. Single-aisle (SA) means that the aircraft has available only one center walkway splitting the rows of seats into two groups of three. The structural data for the fuselage are determined by this cabin design. If one looks at a model of the A320 then its similarity with the A300 and the A310 is unmistakable. In Airbus Industry they make no bones of the fact that

all the results of aerodynamic research for the A300 and A310 have had direct application in the design of the A320. At the same time the little airbus designed as a low-wing plane has no particular optically spectacular features in its layout. The power plants are arranged in gondolas beneath the wing and also in the empennage the airbus designers have engaged in no experiments. Nevertheless, the A320 is packed full not only with new but even with the newest technology.

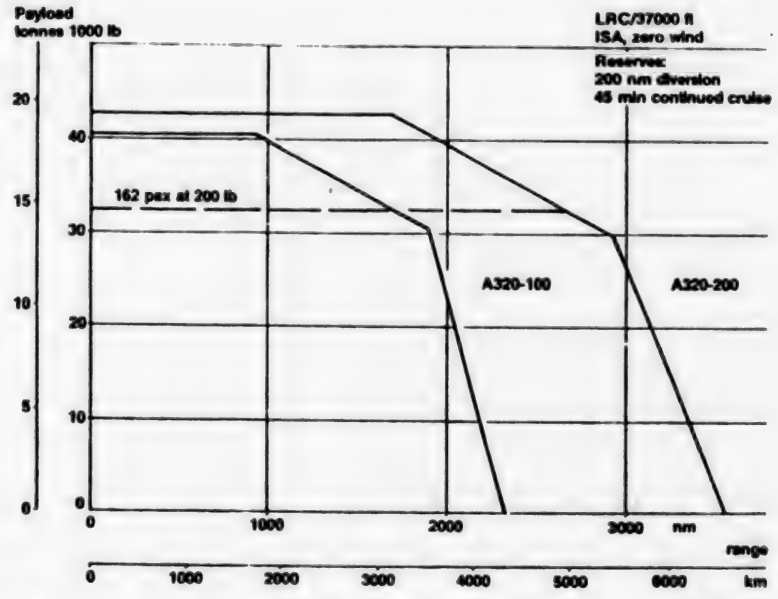
Here one must especially mention the A320 wing which arose directly from development studies for the A310. With a lifting area of 125.8 m^2 and a wing span of 34.48 m the A320 wing has an aspect ratio of 9.5, comparatively very high for a transport plane, with a sweepback of only 25°. Extensive wind tunnel tests were carried out for the aerodynamic definition of the A320 wing. In more than 4,000 wind tunnel testing hours about 50 different A320 variants and 33 further models were investigated. The result is a comparatively smooth wing with a simple flap system and as few movable parts as possible. The spoilers and ailerons are manufactured of fiber-bond materials. The same applies to the elevators and rudders, the cabin floors in the airplane, the cabin claddings, the wing-fuselage crossover, the flaps of the forward landing gear as well as parts of the engine cowling.

But above all the A320 will profit by the new cockpit technology developed for the A300 and A310. Thus the A320 will be offered from the outset only with a two-man cockpit. But also in the system domain the greatest possible agreement between the A320 and its two larger sisters will be striven for. Despite the size difference the airline companies should also obtain full benefit of the airbus family advantages in purchasing the A320.

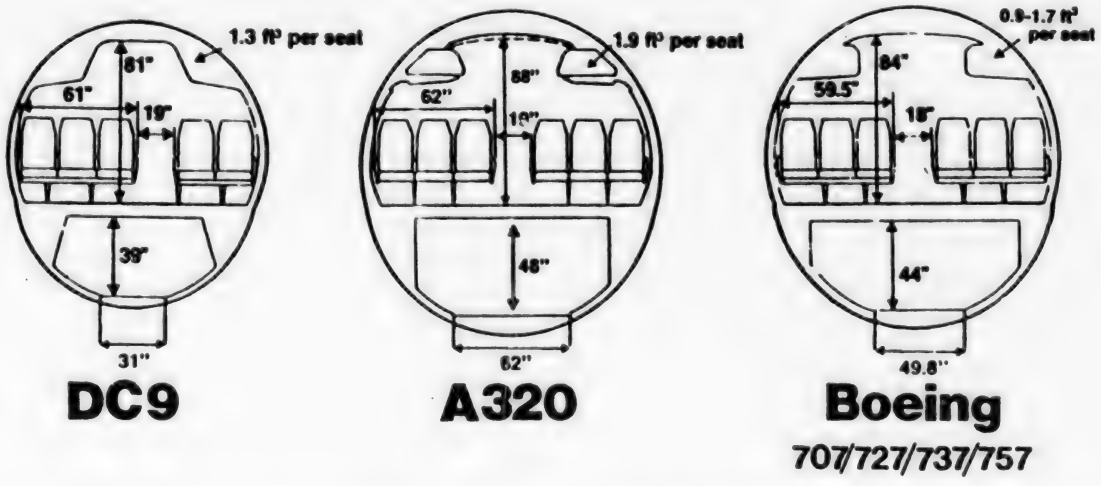
Fuselage Cross Section

Passenger comfort today determines more than ever how an airline company is judged by customers, the passengers. However, in comparison with the "stewardesses' smile" and the on-board service there is one item which is taken with special seriousness by the passengers and that is the space provided in the cabin. Airbus Industry therefore attached special importance to the optimal determination of the fuselage cross section. In so doing it succeeded in producing a geometric miracle in that despite a fuselage cross section almost identical with that of the Boeing 707/727/737/757 there is de facto more shoulder freedom, a slightly broader center aisle and a somewhat higher cabin ceiling available to the passenger. At the same time it was possible to enlarge the floor area in the below-deck freight space as well as increasing the available height in the below-deck compartment by about 10 cm.

In addition, the A320 will have available per seat a substantially more voluminous space for stowing hand luggage. In comparison with the fuselage cross section of the DC-9 the A320 even looks like a small Jumbo although it must be conceded that the DC-9 cabin takes only a maximum of five seats per row. Actually the cabin mockup for the A320 makes a decidedly roomy impression and is full of new detail ideas.



Range-useful load diagram of the A320-100 and -200. Both aircraft versions are almost the same in airframe but differ in tank capacity and maximum takeoff mass.



Comparison of the most important fuselage cross sections (Source: Airbus Industry). All dimension data are given in inches. 1 inch = 2.54 cm.

Opportunities

Wherein now lies the big opportunity for the A320? Why is Airbus Industry so urgent in its position that if this project is to be taken up at all it must be undertaken as soon as possible? The reason is relatively simple: On the one hand there are signs in the market of a great demand for 150-seaters for the two last decades of this century. Apart from the A320 no completely new model is available prior to the A320 from McDonnell-Douglas or from Boeing which aims directly at this size class, assuming maintenance of the schedule dates existing up to now. Boeing, under heavy pressure through the development of 757 and 767 will certainly not begin at the present moment any further fully new aircraft program.

Instead an attempt will be made, for example, with an airplane like the Boeing 737-300 to exhaust market fractions which are as long as possible. A further competitor in the market is, inter alia, the DC-9 Super 80. The advantage of this airplane lies primarily in its fast availability. So it is to be assumed that the Super 80 will still cover a substantial portion of the current market, especially among DC-9 customers.

Thus for the A320 there exists a "historic opportunity." If the aircraft could be fully commenced in the near future then that would imply at the same time that Airbus Industry could assure itself a significant lead in the development of this airplane.

However, a look back at the development of aircraft sales for the individual models shows that the market lead of the airplanes first offered can hardly be overtaken by the second or third planes entering the market without the expenditure of a very special effort.

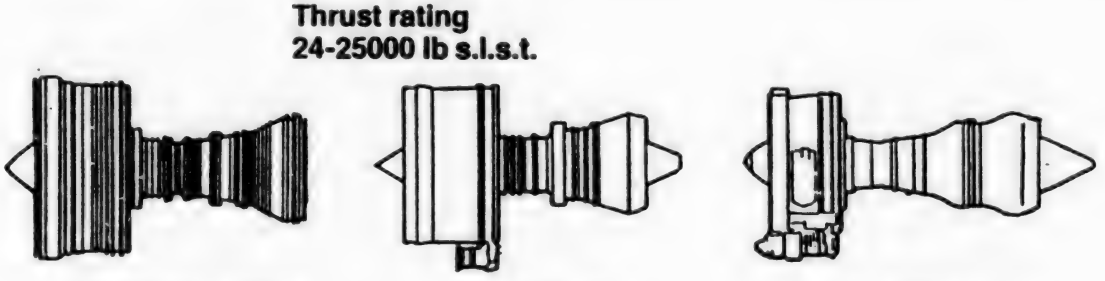
The last decision as to whether the A320 will actually be built depends not least of all upon the attitude of the governments of the participating airbus partner countries. Here, however, one should know that it would probably be cheaper for the realization of such an attractive program to make suitable credits available as needed and in this way guarantee many highly trained job slots rather than having to pay out corresponding sums later on for support of the unemployed. Of all the airbus projects under consideration the A320 appears to be the most attractive project currently both from the point of view of time and also in terms of its design. It is reported that the so hotly anticipated decision by Delta Airlines will probably be made sometime in March if no further delays occur because of problems arising in tailoring the power plant. Thus, it will be possible at the latest to say at the ILA [International Aircraft Exhibit?--Tr.] in Hanover whether Europe has understood how to seize the opportunity presented by the small airbus A320.

With the amalgamation of the two originally planned differently sized A320 versions into a single basic design, which, however, will be offered in two variants having different takeoff weights and tank capacities, Airbus Industry has created in this program an essential prerequisite to cost reduction. In addition to the design simplifications it is necessary de facto for just one more flight test program to be carried out and then the later mass production will also be made easier.

If now efforts were also successful to produce a power plant version for the A320 realizable on an industrial basis without state help largely on the basis of existing engine components and at a relatively low development cost then Airbus Industry would probably be considerably closer to realization of this new airplane even if the dream data with regard to fuel consumption were still not quite attained. This does not exclude the possibility that in the future all advances related to the power plant would flow into the program. But the industrial startup to the point of establishing mass production would, however, be substantially facilitated.

If the A320 program can be carried out as planned then the final specification of the design would probably take place in the coming spring. The first prototype would be assembled in mid-1984. One could figure on the first half of 1985 for the first flight and on model licensing and introduction into line service by the middle of 1986.

Finally, another glance at the potential models competing with the A320: the principal competitor is the Boeing. Here there are four potential competing models under discussion. Here the first to consider would be the Boeing 737-300 which represents an especially attractive offering for those airlines which already have the 737 in service today. With close to 1,000 aircraft of the 737 series sold this model is their best on the market. The same is also true of the 727RE, a twin-jet further development of the current Boeing 727 with modern fan-engines (CFM56) which would combine the advantages of a proven airplane with the economy of modern engines.



The three current engine candidates for the A320 are the CFM56-2000 of General Electric/Snecma, the British-Japanese RJ500-35 of Rolls-Royce and JAEL as well as the STF626M of Pratt and Whitney/MTU/Fiat. The required thrust would be in the order of magnitude ranging from 106 to 110 kN (10,890 to 11,350 HP). The data refer to the program situation in December 1981. However, at the end of the year there were new ideas especially with regard to a more cost favorable CFM56 variant which, however, still cannot meet the very high expectations for reduction of fuel consumption.

A320 Data, Status as of December 1981

Manufacturer	Airbus Industry, Toulouse
Model	A320-100, A320-200
Application	Short to medium range
Engine options	General Electric/Snecma CFM56-2000 or other version on CFM56 basis Rolls-Royce/JAEL RJ500-35 Pratt and Whitney/MTU/Fiat STF 626 M
Thrust class, lbs	24,000 to 25,000
kN	106.6 to 111.1
Cockpit crew	2

Passenger category	150-seater	
Maximum number of seats (typical mixed seat arrangement)	150	
Maximum number of seats (all economy)	162	
Seat arrangement	3+3	
Wing span, m	34.48	
Length, m	34.41	
Height, m	11.78	
Lifting surface, m^2	125.80	
Aspect ratio	9.50	
Sweepback, degrees	25.00	
	A320-100	A320-200
Maximum starting mass, kg	60,000	71,900
Equipment mass, kg	39,248	39,656
Maximum cargo, kg	26,752	32,244
Maximum mass without fuel (MZFW), kg	57,607	59,077
Maximum fuel, kg	12,900	18,800
1	18,170	26,480
Loading example:		
Number of passengers	162	162
Passengers + baggage, kg	14,697	14,697
Freight cargo, kg	3,662	4,724

But there is also competition from the Boeing 757 which it is still not possible to evaluate today. And last but not least there still exists the possibility that Boeing will start a corresponding model in direct competition with the A320 in which Boeing could then also combine all advances of modern aircraft construction in an aircraft design completely new from the ground up.

McDonnell-Douglas has two models in competition with the A320. First there is the DC-9 Super 80, an airplane which is already available today with currently very favorable fuel consumption, meeting environmental standards at a high level and also being modern in its systems. In addition, McDonnell-Douglas is at present developing in cooperation with the Dutch Fokker Works the so-called MDF-100, an airplane design which is also very advanced in which the technological know-how of both entrepreneurs is combined.

Despite this competition the market chances of the A320 should still not be bad since its system homogeneity, right up to the cockpit layout, with the other airbus models should by itself incite many airlines to attain still greater uniformization of their fleets by procuring the A320.

Industrial Alternatives

Despite all positive prognoses and despite the order placed by Air France the possibility is, however, not to be excluded that the A320 program will not take the course desired for lack of an adequate number of orders, for one reason or another. But also for this contingency Airbus Industry is prepared and would with great probability undertake one or more of the currently possible programs for further development of the A300/A310. Here to be considered are the new airbus versions TA9/TA11/TA12. The abbreviation TA stands for twin aisle, in other

words for a roomy fuselage design permitting two aisles in the passenger cabin in contrast to the "thin-fuselage airplanes" (SA).

Airbus TA9

The airbus TA9 project involves a special version which is designed for routes having heavy traffic and medium length. According to market analyses the airlines would require such a further development beginning somewhere about the middle of the eighties. In comparison with the previous A300B2/B4 versions the airbus TA9 would have a passenger capacity increased by 25 percent. Also it is expected that the TA9 would be offered both in a short-range and a medium-range version.

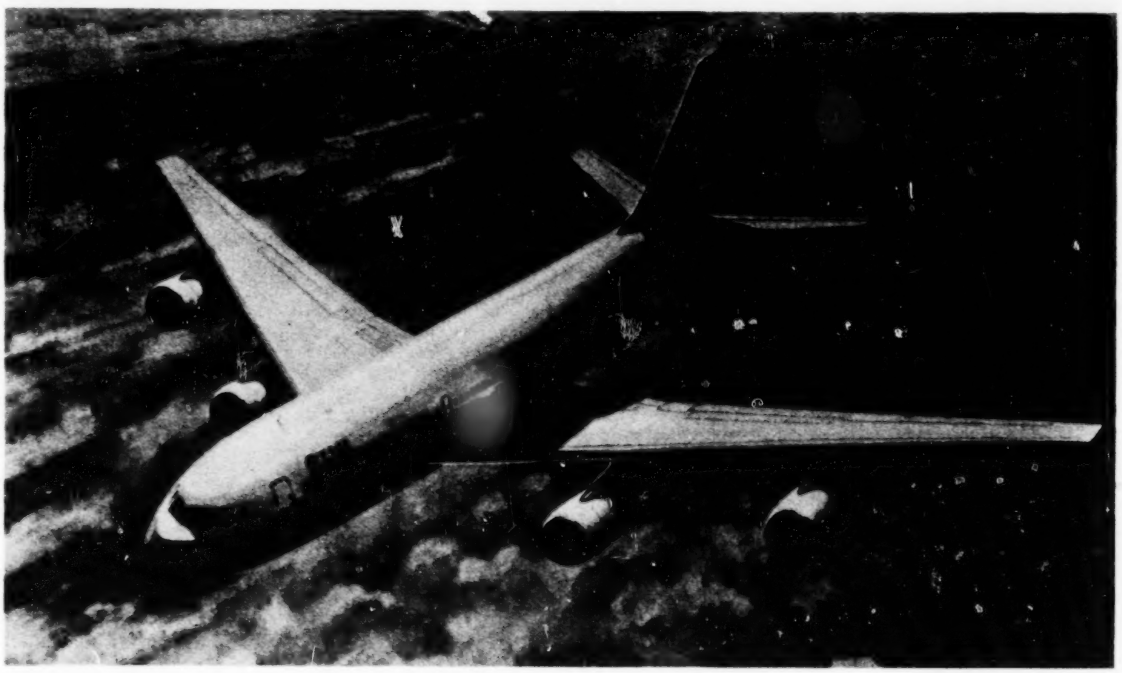
In short-range transport the TA9 would be capable of carrying 350 and 425 passengers over 1,800-km routes with the required takeoff distances being about 2,100 m. The long-range version would be capable of transporting 325 passengers over a route ranging up to 5,550 km. Of course, the TA9 would coincide in all essential components with the A310/A300-600. It is true that such an aircraft would require engines of the 60,000-pound thrust class (266 kN). It is noteworthy in this connection that the TA9 in its below-deck freight space could carry more freight than a Boeing 747. The airbus TA9 version would have a length of 62.02 m and a wingspan of 56 m. In comparison with the current airbus A300B4 models the fuel consumption on a passenger-kilometer basis could be reduced by about 27 percent and would thus be even below the corresponding values of the Boeing 747SR whose economy in terms of fuel consumption has hitherto been considered to be unapproached.

Airbus TA11

Up to now the airbus family has specialized in short- and medium-route operation. For long-range transport Airbus Industry is still offering no airplane model. This should change when the TA11 is produced. This involves a four-jet further development of the A300/A310 with the TA11 wings largely identical with the already-designed TA9 version. The TA11 would be designed for long routes having passenger traffic which is not sufficient to be flown logically, for example, by a Boeing 747. Depending upon seat arrangement and passenger class distribution the TA11 could transport 228 to 253 passengers. On the basis of current engine technology the TA11 with 236 passengers would achieve a maximum range of 6,830 nautical miles (12,650 km).

Within the framework of the TA11 studies Airbus Industry has also investigated the possibility of a three-jet aircraft with two engines supported by pylons below the wings and the third engine positioned as in the DC-10 or the Lockheed TriStar in the tail. Surprisingly, this investigation showed that the four-jet airplane for a given passenger capacity and route length would have a total weight less than a corresponding three-jet airplane having an engine in the tail. In addition, for practical flight operation in the four-jet version there would be a simpler CG management. Despite the four-jet construction Airbus Industry calculates that the TA11 would still be 60-percent identical with the A300/A310 initial version.

Designed for the expected high passenger numbers of the late eighties is the airbus TA9 which can carry up to 425 passengers and would range substantially below present-day airbus versions in terms of its passenger-kilometer costs. However, the development of a new wing would be unavoidable which would also be usable on the four-jet TA11.



A model to succeed today's DC-8 and 707 fleets is the four-jet airbus T11 offering which is specially designed for long routes having medium passenger traffic and which would also probably encounter a substantial market potential in the middle of the eighties.

Airbus TA12

As a third airbus further development the TA12 is also under discussion. This is a version having medium passenger capacity for medium-long-route ope-ation, for example, in continental transport within the United States. Depending upon passenger seat arrangement the TA12 would offer somewhere between 228 and 253 passenger places. At a passenger loading of 236 the TA12 would be in a position to fly over routes ranging up to 9,100 km.

Which of the last-mentioned A300/A310 further developments will have the greatest priority is something to be determined by the market. However, the dramatic deterioration of the operating economics of older four-jet long-route transport airplanes as a result of the aircraft fuel cost explosion puts the market chances for an aircraft like the TA11 in a particularly favorable light. Therefore one may proceed from the assumption that even if the 320 program of current planning is fully carried out the airbus versions TA9 and TA11 will be required in the second half of the eighties and will therefore be built. This would mean that in a not-too-distant future there would have to be an official program start for one or the other version. If as expected the current depression in international airline transport is soon overcome and passenger figures once again display their customary rates of growth then the TA9 and the TA11 will probably be quite soon called for by the market. The coming months will bring interesting decisions.

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MARCH 22, 1982